TULPAN, Ion

Applying wage forms in industry. Probleme econ 15 no.3:33-46 Mr '62.

1. Adjunct al Ministrului Finantelor.

SMIRNOV, Vyacheslav Konstantinovich; TUL'PA, S.M., nauchnyy red.; BONDAROVSKAYA, G.V., red.; TOKER, A.M., tekhn. red.

[Boring lathe operator]Tokar'-rastochnik. Moskva, Proftekh-izdat, 1962. 362 p. (MIRA 15:10)
(Metal cutting) (Lathes)

USSR/Virology - Bacterial Viruses (Phages).

Abs Jour : Ref Zhur - Biol., No 5, 1958, 19246

Author : Chuke, M., Nestorenko, M., Popovich, M., Tulpan, G.
Inst : -
Title : The Problem of Phage Biology. Spectral Characteristics of Lysogenic Activity of Intestinal Phage "H Delta" After a Prolonged Holding in a State of Symbiosis With Strain "Coli M 1920".

Orig Pub : Zh. med. nauk Akad. RNR, 1956, 1, No 3, 61-74

Abstract : As a result of action of phage "H. Delta" on Borde and Chuke sensitive coli, a lysogenic culture "coli M" was obtained in 1920. The authors studied the properties of the phage mentioned after holding for 34 years in "symbiosis" with cells of "coli M," and during this period it was subjected to 347 consecutive inoculations. The polyvalent phage properties which, according to data of 1920-21, lysed a number of cultures of [illegible]

Card 1/2

USSR/Virology - Bacterial Viruses (Phages)

Abs Jour : Ref Zhur - Biol., No 5, 1958, 19246

and Shigella, was fully preserved after many years of symbiosis. Phage or culture "coli M" was capable of lysing a number of Salmonella cultures and other varieties, among them also S. typhi O_{901}. Of the 12 phages from subcultures of lysogenic variant O_{901}, 9 fully preserved their polyvalency and 3 lost their ability to lyse strain "coli Brz. R," which was lysed by the initial phage.

Card 2/2

TULPAN, Ion

Aspects of increasing the profitability of state farms.
Probleme econ 16 no.10:43-55 O '63.

1. Adjunct al Ministrului Finantelor.

TUL'SKAYA, N.M.

Organization of readers' conferences. Opyt rab. po tekh. inform. i prop. no.1:31-32 '63. (MIRA 16:12)

1. Direktor TSentral'noy nauchno-tekhnicheskoy biblioteki Soveta narodnogo khozyaystva Leningradskogo ekonomicheskogo rayona.

SAULIT, V.I.; TUL'SKAYA, N.M., otv.red.; SHALGIN, G.N., nauchno-tekhn.red.
AVTOSYAK, N.N., red.; SEMENOVA, A.V., tekhn.red.

[Internal potentials in machinery plants; index of literature]
Vnutrennie rezervy na mashinostroitel'nom predpriiatii; ukazatel'
literatury. Leningrad, TSentral'noe biuro tekhn.informatsii,
1959. 47 p. (MIRA 13:4)

1. TSentral'naya nauchno-tekhnicheskaya biblioteka.
(Bibliography--Mechanical engineering)

KIRGINTSEV, A.N.; TUL'SKIY, A.S. [deceased]

Mathematical calculation of the processes of separation by zone melting. Izv. Sib. otd. AN SSSR no.5:121-126 '62. (MIRA 18:2)

1. Institut neorganicheskoy khimii Sibirskogo otdeleniya AN SSSR, Novosibirsk.

(3) 1964

S/210/63/000/001/003/003
E032/E314

AUTHORS: Plekhanov, G.F., Vasil'yev, N.V., Demin, D.V., Zhuravlev, V.K., Zenkin, G.M., Kovalevskiy, I.F., L'vov, Yu.A., Tul'skiy, A.S. (Deceased) and Fast, V.G.

TITLE: Some results of studies of the problem of the Tungusska meteorite

PERIODICAL: Geologiya i geofizika, no. 1, 1963, 111 - 123

TEXT: A Composite Independent Expedition (CIE) was organized in 1959 and a number of scientific workers and engineers from institutions of Tomsk, Moscow, Novosibirsk and other towns participated in it. The aim of this expedition was to carry out a composite study of the region of the fall of the meteorite. Field work was carried out in 1960 together with a Moscow expedition directed by V.A. Koshelev. There was an expedition in the summer of 1961 organized by the Komitet po meteoritam AN SSSR (Committee for Meteorites of the AS USSR) under the direction of K.P. Florenskiy. The CIE was a part of the latter expedition. Parallel field work was carried out during 1959-1961

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S/210/63/000/001/003/003
E032/E314

Some results of ....

by the Committee for Meteorites (B.I. Vronskiy - 1959-1960 and A.V. Zolotov - 1959-1961). The present paper reviews briefly the results obtained by the CIE and compares them with those obtained by other workers. A chart is reproduced showing the marsh and woodland distribution and magnetometric profiles in the neighbourhood of the epicentre. It was found that the marshes were apparently natural formations, unaffected by the fall but there were some arboreal features indicating the effect of the fall on trees. A study was made in 1960 of the felling of trees as a result of the fall of the meteorite. Analysis of these data showed that the height at which the meteorite exploded was 10.5 ± 3.5 km. Magnetometric searches revealed the absence of major magnetic losses. Other studies revealed a region with enhanced concentration of Ni, Co and Mo in the soil and Ce, La, Y and Yb in the wood ash. This region was 2-6 km N.W. of the epicentre. A further series of measurements was concerned with the residual radioactivity in the region. Previous conclusions regarding the increase in radioactivity near the epicentre, as compared with greater distances, were not confirmed. It is suggested that the

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Some results of ....

earlier measurements revealed traces of fall-out due to American nuclear tests in 1958. Analysis of these and other published data leads the authors to suggest the following working hypothesis. In the middle of June, 1908, the Earth passed through a cosmic-dust cloud which entered the atmosphere and sedimented between 55 and 65° N. On reaching the lower layers of the atmosphere, dust particles gave rise to anomalous airglow and development of noctiluscent clouds at isolated points in Europe between June 22 and 29. The amount of dust was not, however, too great and hence the optical anomalies associated with it were localized and there was no change in the polarization of the day sky. In the morning of June 30, the Earth entered the part of the cloud containing large dust-particle clusters and the penetration of these clusters into the lower layers gave rise to a change in the polarization and the appearance of a solar halo and noctiluscent clouds. At the same time, a major meteoritic body entered the atmosphere. The resistance experienced by the body (dense swarm of particles) increased rapidly at the boundary of the troposphere with the result that the body was decelerated and the available magnetic

Card 3/4

energy was converted into the energy of the explosion. This hypothesis is not fundamentally different from that put forward by V.G. Fesenkov (cometary hypothesis). It is suggested that the differences may be of terminological origin. This must be investigated further. There are 1 figure and 1 table.

ASSOCIATIONS: Tomskiy meditsinskiy institut (Tomsk Medical Institute)
NII Tomskogo politechnicheskogo instituta (NII of Tomsk Polytechnical Institute)
Institut geologii i geofiziki Sibirskogo otdeleniye AN SSSR (Institute of Geology and Geophysics of the Siberian Division of the AS USSR)

SUBMITTED: April 9, 1962

SOV/84-58-12-35/54

AUTHOR: Tul'skiy, G., Deputy Principal of the School for Political Affairs, and V. Gol'dvasser, V., Deputy Principal of the School's Teaching Department

TITLE: Improving the Training of Aviation Technicians (Uluchshit' podgotovku aviatsionnykh tekhnikov)

PERIODICAL: Grazhdanskaya aviatsiya, 1958, Nr 12, p 26 (USSR)

ABSTRACT: The authors express their views on the advisability of revising the teaching system at the Troitskoye aviatsionno-tekhnicheskoye uchilishche (Troitsk Aviation-Technical School). At present, more than twice as much time is devoted to theoretical studies than to practical work. Students engage in field projects only shortly before state examinations. This results in a student fear of practical assignments and leads to a considerable turnover in student personnel. The authors propose the introduction of practical training for all classes, the deletion of some theoretical subjects, and the reduction of freshmen summer vacations to one month. Practical training should preferably be given at

Card 1/2

Improving the Training (Con.)

advanced units and LERM shops staffed by qualified personnel. Students should be trained in technical servicing, performance techniques, and the principles of aviation. It was further suggested to substitute dissertations for state examinations for graduate students.

TUL'SKIY, G.; GOL'DVASSER, V.

Improve training in aviation schools. Grazhd.av. 15 no.12:26 D '58. (MIRA 12:2)

1. Zamestitel' nachal'nika Troitskogo aviatsionno-tekhnicheskogo uchilishcha po politicheskoy chasti (for Tul'skiy). 2. Zamestitel' nachal'nika uchebnogo otdela Troitskogo aviatsionno-tekhnicheskogo uchilishcha (for Gol'dvasser).
(Aeronautics--Study and teaching)

TUL'SKIY, L.

"Soviet Crystal Sets", Radio, No. 4, 1948, pp 48-51.

SO: W-17755, 17 Apr 1951

TUL'SKIY, L.

PA 4/49T80

USSR/Radio Equipment
Demodulators Apr 48

"Detector Sets With One Knob," L. Tul'skiy, 4 pp

"Radio" No 4

Describes crystal detector receiver which incorporates a new-type sliding contact permitting the use of only one knob for tuning and volume control of the set. Set is cylindrical with the knob on the top panel.

FDB

4/49T80

TUL'SKIY, M.S.

Accumulation of water-soluble nitrogen in meal mash for yeast during the process of mash souring. Izv.vys.uchob.zav.; pishch. tekh. no.1:78-83 '59. (MIRA 12:6)

1. Moskovskiy tekhnologicheskiy institut pishchevoy promyshlennosti, kafedra obshchey tekhnologii pishchevykh proizvodstv.
(Yeast)

TUL'SKIY, M. S. Cand Tech Sci -- "Accumulation of water-soluble nitrous substances in flour mash during its B. Delbrüoki ~~(B. Delbrüoki)~~ leavening." Mos, 1960 (Min of Higher and Secondary Specialized Education RSFSR. Mos Technological Ins of Food Industry). (KL, 1-61, 198)

OSTROVSKIY, A.I., prof.; DONETSKAYA, T.F., nauchnyy sotrudnik; TUL'SKIY, M.S., kand.tekhn.nauk; FEDOROVA, G.S., starshiy nauchnyy sotrudnik

The most efficient way to use corn flour in bread making. Trudy MTIPP no.19:15-21 '62. (MIRA 17:4)

TUL'SKIY, M.S.

TUL'SKIY, M.S.

Accumulation of water soluble nitrogen in yeast mashes in relation to the quantity of Aspergillus oryzae ferment added to them. Khleb. i kond. prom. 1 no.9:9-11 S '57. (MIRA 10:11)

1. Moskovskiy tekhnologicheskiy institut pishchevoy promyshlennosti.
(Yeast) (Aspergillus oryzae) (Nitrogen)

TUL'SKIY, M.S.

Mechanization and intensification of production of soft roofing materials. Stroi. mat. 6 no.12:20-22 D '60. (MIRA 13:11)

1. Glavnyy inzhener Kuybyshevskogo ruberoydnogo zavoda.
(Roofing)

ACC NR: AP7004806 (N) SOURCE CODE: UR/0413/67/000/001/0144/0144

INVENTOR: Vysokorodov, N. S.; Pavlov, M. P.; Tul'skiy, N. N.; Bystrov, G. N.

ORG: None

TITLE: A manually operated booster. Class 65, No. 190231

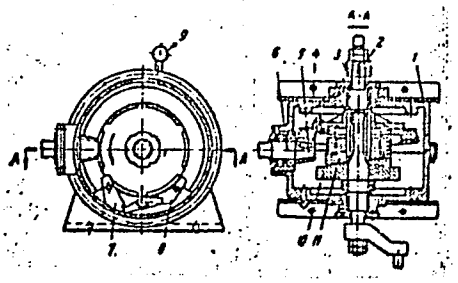
SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 1, 1967, 144

TOPIC TAGS: water pump, ship component, marine equipment

ABSTRACT: This Author's Certificate introduces a manually operated booster designed principally for lifeboats. The unit includes a drive shaft located in a housing and driven by manual rockers through cranks. Fastened to the drive shaft is a bevel gear which interacts with a second bevel gear on the driven shaft. A control lever acts on dogs which pivot on axles in the housing. The installation is designed so that the drive may be stopped positively and smoothly at any moment of operation. Two clutch sections with oblique contacting faces are mounted on the drive shaft. One section is spring loaded and moves in the axial direction while the other is loosely mounted and has peripheral teeth for selective interaction with the rotating dogs.

Card 1/2 UDC: 629.125.2-514.4

ACC NR: AP7004806



1--housing; 2--drive shaft; 3--cranks; 4 and 5--bevel gears; 6--driven shaft; 7 and 8--dogs; 9--lever; 10 and 11--clutch sections

SUB CODE: 13/ SUBM DATE: 24Mar65

Card 2/2

TUL'SKIY, S.V.

Spectra of a piezoelectric resonance of biopolymers. Zhur. strukt. khim. 6 no.2:304-305 Mr-Ap '65. (MIRA 18:7)

1. Moskovskiy gosudarstvennyy universitet imeni Lomonosova.

BORISOV, A.; TUL'SKIY, V.

Motor vehicles in people's Poland. Za rul. 16 no.3:10-11 Mr '58.
(MIRA 13:3)
(Poland--Transportation, Automotive)

TUL'TSEVA, N.M.; ASTAUROV, B.L.

Increased resistance of polyploid silkworm embryos (Bombyx mori L.) to radiation injuries in connection with the general theory of the biological effect of ionizing radiations [with summary in English]. Biofizika 3 no.2:197-205 '58. (MIRA 11:4)

1. Institut morfologii zhivotnykh im. A.N.Severtseva.
(SILKWORMS) (RADIATION--PHYSIOLOGICAL EFFECT)
(POLYPLOIDY)

TULUB, A. V.

Kibernetika [Cybernetics]. Society for the Dissemination of Political and Scientific Knowledge RSFSR, Leningrad, 1957, 35 pages.

TULUB, A.V.

On the theory of interaction of lattice vibrations with electrons [with summary in English, p.152]. Vest. Len. un. 12 no.4:53-56 '57. (MLRA 10:4)
(Electrons) (Crystal lattices) (Excitons)

TULUB, A.V.

Relativistic correction for Maxwell distribution. Vest.LGU 12 no.10:65-67 '57. (MLRA 10:8)
(Statistical mechanics)

PA - 2042

AUTHOR: NOVOŽILOV,JU.V., TULUB,A.V.

TITLE: The Method of Functionals in the Quantum Theory of the Field (Russian).

PERIODICAL: Uspekhi Fizicheskikh Nauk, 1957, Vol 61, Nr 1, pp 53-102 (U.S.S.R.)

Received: 3 / 1957 Reviewed: 3 / 1957

ABSTRACT: The present survey is arranged as follows:

I. The method of functionals in the Quantum Theory of the Field: Introduction: Art. 1) The quantum theory of the field and the functionals. Art. 2) FOK'S method of functionals: Idea of the method, the deducing functional for the probability amplitudes, the method of the functional and the statistics by FERMI, the equations for the functional of state. Art. 3) The deducing functional for the amplitudes of the new method by TAMM-DANKOV.

II. The deducing functionals for the relativistic functions, and functional integration:
Art. 4) The deducing functionals for the relativistic functions: The T-function and the deducing functional, FEYNMAN'S amplitudes and the deducing functional, the function Q.
Art. 5) The space-time treatment of the quantum theory of the field and the functionals: The basic equations for the fourdi-

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mensional state vector, the generalizing FOK functional, the functional FOURIER transformation.
Art. 6) The variation of the operator and the functional integration of the FERMI field:
In contrast to other methods functional methods permit strict formulation of the equations for the field functions and make it possible to find a formal solution of the problem of fields that are in interaction. This special feature of the method of functionals is important for investigations of a basic character and also for the working out of approximation methods (which differ from the perturbation theory) for the solution of field equations. At present work connected with the method of functionals can be subdivided into two groups (from the point of view of using the functional apparatus): works concerning the investigation of deducing functionals, and works that are connected with the use of functional integration. The idea of the method of the deducing functional was brought forward for the first time by the member of the Academy V.A.FOK in 1928, and was worked out in detail

The Method of Functionals in the Quantum Theory of the Field (Russian). PA - 2042

in his work of 1934. This method was then used for the solution of several problems in the course of the years that followed, but it was not applied and developed on a large scale until recently. The most important development of the method of functionals is connected with the introduction of the functionals of the exterior sources by SCHWINGER.

ASSOCIATION: Not given
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress

Card 3/3

AUTHOR: Tulub, A. V. 54-1-3/17

TITLE: On a Method of Calculating the Statistical Matrix
(Ob odnom sposobe vychisleniya statisticheskoy matritsy)

PERIODICAL: Vestnik Leningradskogo Universiteta Seriya Fiziki i Khimii (Nr 1), 1958, Nr 4,

ABSTRACT: The problem of calculating the statistical matrix is reduced to the solution of the Heisenberg equations of motion with the quantity

$$s = -i\frac{1}{kT}$$

(k- Boltzman's constant, T - absolute temperature). The integral representation of the statistical matrix for the relativistic electronic gas was ascertained by employing V. Fok's method of the proper time (Ref. 1). The method of calculating the statistical matrix described here is well suited to be used for all problems in which the solution of Heisenberg's equations of motion can be found. This method is especially effective in the case of relativistic gas because computation in energetic representation is rendered more difficult by the complicated nature of the

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On a Method of Calculating the Statistical Matrix 54-1-3/17

wave functions according to Dirac in the presence of exterior fields. The author thanks V. A. Fok for his advice.
There are 7 references, 4 of which are Slavic.

SUBMITTED: April 30, 1957

AVAILABLE: Library of Congress

1. Statistical matrix-Motion equations-Analysis

Card 2/2

TULUB, A.V.

Statistical matrix calculation [with summary in English]. Vest.LGU 13, no.4:23-29 '58. (MIRA 11:4)
(Matrix mechanics)

AUTHOR: Tulub, A. V. SOV/56-34-6-39/51

TITLE: The Phonon Interaction of Electrons in Polar Crystals (Fononnoye vzaimodeystviye elektronov v polyarnykh kristallakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 6, pp. 1641-1643 (USSR)

ABSTRACT: The paper derives the potential of the phonon interaction of the electrons (taking into account their relative momentum) in the approximation of the intermediate coupling. The operator for the energy of interaction of an electron with a phonon field may be given by

$$\sum_k V_k a_k e^{i\vec{k}\vec{r}} + V_k^* a_k^+ e^{-i\vec{k}\vec{r}}, \quad V_k = -(i\omega/k)(1/2\, m\omega)^{1/4}(4\pi\alpha/V)^{1/2}$$

$\alpha = \frac{e^2}{2}(\frac{2m}{\omega})^{1/2}(\frac{1}{n^2} - \frac{1}{\varepsilon})$. α plays the rôle of a coupling constant, m denotes the effective electron mass, ω - the limit frequency of the longitudinal optical oscillations, a_k - the operators of the second quantization. The operator for the

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energy of the two-electron problem is given in an explicit form. This paper investigates, for reasons of simplicity, only the case with the total momentum zero. From the total energy operator 3 terms are separated, they describe the "free" motion of a polaron with the effective mass μ in the system corresponding to the center of gravity of two particles. The other terms in the total energy operator complicate the motion of the free polaron and describe the influence of the second particle on the motion of the first one; they play the rôle of the potential energy operator. The difference of the phonon interaction potential from the Coulomb potential is due to the recoil caused by the phonon emission. Because of these recoils the electrons get fluctuation shifts and this leads to an additional interaction energy. For Cu_2O the interaction potential differs from the Coulomb potential by 10-15 Å. Therefore the ground level and partially also the higher levels of the exiton energy are shifted downwards. There are 5 references, 2 of which are Soviet.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)

The Phonon Interaction of Electrons in Polar Crystals SOV/56-34-6-39/51

SUBMITTED: February 28, 1958

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24(5)
AUTHOR: Tulub, A. V.

SOV/56-36-2-32/63

TITLE: The Influence of the Interaction of the Electron With Oscillations of the Crystal Lattice on the Frequency of Cyclotron Resonance (Vliyaniye vzaimodeystviya elektrona s kolebaniyami kristallicheskoy reshetki na chastotu tsiklotronnogo rezonansa)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 2, pp 565-573 (USSR)

ABSTRACT: The phenomenon of cyclotron resonance occurs if in the uniform magnetic field the frequency of the superimposing variable field is equal to the double Larmor frequency ($2\omega_o = eH/m^*$). By means of experiments carried out in this connection it is possible to determine the effective mass m^* or, quite generally, the mass tensor. The author of the present paper theoretically investigates the influence exercised by the interaction between electron and lattice oscillations (electron-phonon interaction) in the case of resonance frequency. This interaction causes nonlinearity of the dependence of ω_o on the field strength H; the problem is thus reduced to determining the nonlinear terms of this func-

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tion. The author determines them for the case of polar crystals and considers the effective mass to be isotropic. For such crystals electron-phonon interaction cannot be treated as a perturbation problem. For high values of the coupling constants it is possible to calculate in adiabatic approximation (Ref 1); for $\alpha = 1 \div 4$ the approximation corresponds to intermediate coupling. The author uses the latter. He develops a method of mass renormalization based upon the approximated elimination of the variable phonon field from the energy operator. Calculation of the commutator of the phonon absorption operator is carried out by means of the Hamiltonian; the action of a_k upon the eigenfunctional of the energy operator Ω is found. This method has been suggested for the meson theory already by Chew,Low (Chu,Lou) and Vik (Ref 2). In the calculation of the energy mean value terms which depend on electron momentum occur those which receive squares of the momentum serve the purpose of determining the renormalized mass. For mass renormalization in the presence

The Influence of the Interaction of the Electron With Oscillations of the Crystal Lattice on the Frequency of Cyclotron Resonance

SOV/56-36-2-32/63

of a magnetic field it is not necessary to assume the coupling constant to be small. Calculation of nonlinear terms in the function describing the dependence of ω_0 on H show that these terms are small for fields occurring in practice. The polaron effect leads also to a correction in diamagnetic susceptibility. There are 7 references, 2 of which are Soviet.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)

SUBMITTED: August 22, 1958

Card 3/3

24(5), 24(2)

AUTHOR: Tulub, A. V.

SOV/56-36-6-33/66

TITLE: The Free Length of Path of the Exciton in Polar Crystals (Dlina svobodnogo probega eksitona v polyarnykh kristallakh)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 6, pp 1859-1868 (USSR)

ABSTRACT: For excitons with large radii the Wanier-Mott approximation holds, according to which the exciton may be represented by a system consisting of electron + positively charged hole (between electron and hole there is Coulomb interaction). The periodic lattice field is taken into account by the introduction of effective masses. Electron and hole interact with the crystal lattice, in which case in polar crystals the main part is played by the interaction between particles and longitudinal optical phonons, which is known from the polaron theory. The existence of phonon interaction leads, according to Haken, to the fact that at large distances the potential has the form $-e^2/\varepsilon r$, and at small distances the form $-e^2/n^2 r$ (ε is the dielectric constant, n - the refraction index of light). If the effective masses of electron and hole are equal (as is the case in cuprous oxide), phonon interaction does not vanish and the exciton causes lattice polarization. The approximated representation of the

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wave function system $\Psi(\vec{r},a) = \Psi_n(r)\Omega(a)$, which is known from publications, and where $\Psi_n(r)$ is a function of the spatial coordinates r and $\Omega(a)$ - a functional that depends only on the variable phonon field, in the case of the effective masses being equal causes the collision probability for phonon and exciton to become equal to zero and the free length of path to tend towards infinity. Taking the interaction between the exciton and the acoustic lattice vibrations into account does not change this fact. In order to obtain a finite collision probability it is necessary to operate with more exact functionals that describe the exciton state. The mathematical apparatus for dealing with this problem was worked out by Low (Ref 8); it makes it possible to calculate the phonon scattering cross section without using the ordinary scheme of the perturbation theory. For polar crystals, in which there is strong or intermediate coupling, the exciton-phonon scattering calculations are carried out in the present paper according to Low, viz. for intermediate coupling. The scattering amplitude is expressed according to Low in terms of matrix elements between exact eigenstates of the Hamiltonian (cf. Low and Pines, reference 10). These eigenstates correspond to the initial and final states of the

scattered exciton; for the purpose of describing these states Haken's exciton wave functions are used as basic approximation. Detailed calculations are carried out for the case of large quantum numbers and for the ground state of the exciton. It is found that the mean free path of the exciton remains infinite also in the case of equal effective masses of electron and hole. The author finally thanks Academician V. A. Fok for discussions. There are 13 references, 6 of which are Soviet.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)

SUBMITTED: December 31, 1958

86337

S/054/60/000/004/011/015
B006/B056

24.4500

AUTHOR: Tulub, A. V.

TITLE: Consideration of Recoil in the Nonrelativistic Quantum Field Theory

PERIODICAL: Vestnik Leningradskogo universiteta. Seriya fiziki i khimii, 1960, No. 4, pp. 104-118

TEXT: Investigation of recoil in the nonrelativistic scalar field theory is of interest for two reasons: First, the scalar theory is the simplest model on the basis of which the effect of the terms taking recoil into account upon the intrinsic energy and the renormalized mass can be studied; secondly, the recoil effects are of importance in the solid-state theory. The author now develops a method of investigating a system consisting of a quantized field and nonrelativistic particles in quantum-field theory. These particles are assumed to interact with that field (a neutral boson field). This system is characterized by the energy operator $H = -\frac{1}{2}\nabla^2 + \sum\omega_k^0 a_k^+ a_k + g\sum_k V_k(a_k e^{ikr} + a_k e^{-ikr})$, where ω_k^0 and $V_k = V_k^*$

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Consideration of Recoil in the Nonrelativistic Quantum Field Theory

are given functions of k; g is the coupling constant; a_k and a_k^+ are the second-quantization operators of the Bose field; and $\left[a_k, a_{k'}^+\right] = \delta_{kk'}$. The particle mass is taken to be one, and also $\hbar = 1$. The particle coordinates r can be eliminated by a canonical transformation, and, after another canonical transformation, the energy operator can be written as $H = H_0 + H_1$ according to Lee , Low, and Pines. The first term of this relation is diagonalizable by the Wentzel method. If the field is considered to be a set of oscillators, the interaction between field and source results 1) in a displacement of the oscillators, 2) in a change in the natural oscillation frequency, and 3) in an appearance of terms in the expression for total energy, which lead to anharmonicity. The author first determines the energy of the ground state of the Hamiltonian H_0, and gives a solution for the equations of the field operators for a continuous spectrum in the $\vec{k}$-space. Further, the eigenfunctions of H are studied, and a variational principle for f_k is formulated (according to Lee et al.: $U = \exp\left\{\sum_k f_k(a_k - a_k^+)\right\}$; $U^{-1} a_k U = a_k + f_k$). The energy is calculated for the

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Consideration of Recoil in the Nonrelativistic Quantum Field Theory

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case of weak and intermediate coupling, and a polaron problem is discussed for illustration. In this case, an exact solution may be obtained also for the region of strong coupling. Academician V. A. Fok is thanked for discussions. There are 9 non-Soviet references.

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TULUB, A.V.

Consideration of recoil in the nonrelativistic quantum field theory [with summary in English]. Vest. LGU 15 no.22:104-118 '60. (MIRA 13:11)

(Field theory)

TULUB, A. V., CAND PHYS-MATH SCI, "THEORY OF ELECTRON-PHOTON INTERACTION IN POLAR CRYSTALS." LENINGRAD, 1961. (LENINGRAD STATE PED INST IM A. I. GERTSEN). (KL, 3-61, 205).

S/056/61/040/002/017/047
B112/B214

AUTHOR: Tulub, A. V.

TITLE: The effect of recoil on the interaction between two particles in the nonrelativistic quantum-field theory

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 2, 1961, 488-490

TEXT: A system of two particles interacting with each other by means of a scalar boson field is considered from the standpoint of the non-relativistic theory. Assuming $\hbar = 1$ the energy operator of the system has the form: $H = H_0 + \sum_k \omega_k a_k^+ a_k + g \sum_k (V_k e^{i\vec{k}\vec{R}} a_k + V_k^* e^{-i\vec{k}\vec{R}} a_k^+)$,

$H_0 = -\frac{1}{2M}\nabla_k^2 - \frac{1}{2\mu}\nabla_r^2 + W(r)$, where a_k and a_k^+ are the operators of the second quantization, M is the total mass, μ the reduced mass, R the coordinates of the center of mass, and W(r) the given

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potential as a function of the distance r between the two particles.
Finally, $V_k(r) = \gamma_k \left\{ \exp\left(i \frac{m_1}{M} \vec{k}\vec{r}\right) \pm \exp\left(-i \frac{m_2}{M} \vec{k}\vec{r}\right) \right\}$.

The problem consists in the determination of the eigenvalues of the operator H for any g. To this end a system of auxiliary functions $f_k(r,R)$ are used which satisfy the condition $\sum_k (f_k^* \nabla f_k - f_k \nabla f_k^*) = 0$. With the help of the functions f_k, the operator H is subjected to the canonical transformation $S = \exp\left\{ \sum_k (a_k f_k^* - a_k^+ f_k) \right\}$. The transformed operator is, therefore, $S^{-1}HS$. The auxiliary functions f_k are determined from the restrictive conditions and substituted in the expression for the energy $E = \langle H_o \rangle + \sum_k \langle V_k(r) e^{i\vec{k}\vec{R}} f_k \rangle$. The formula so obtained is particularized

The effect of recoil on the interaction... S/056/61/040/002/017/047
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for the case $m_1 = m_2$ and illustrated by a numerical example. There are 5 references: 2 Soviet-bloc.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet
(Leningrad State University)

SUBMITTED: January 17, 1960

Card 3/3

31779
S/056/61/041/006/025/054
B102/B138

24,7700 (1144, 1160, 1385, 1559)

AUTHOR: Tulub, A. V.

TITLE: Slow electrons in polar crystals

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 41, no. 6(12), 1961, 1828-1838

TEXT: The theory of interaction between a non-relativistic particle and a scalar field is applied to a polar crystal. According to S. I. Pekar (Issledovaniye po elektronnoy teorii kristallov - Studies in the field of electron theory of crystals - Gostekhizdat, 1951) a polar crystal may be regarded as a continuous medium in which the periodicity of the field is described by a suitable effective electron mass m. m is the main unknown parameter and is determined by the electron-phonon interaction constant g, when the carrier mobility is known. Mobility has therefore to be determined as a function of g in a wide range. The intermediate coupling range is of special interest. It may be approached from either of two extremes, weak or strong coupling. The scattering of optical phonons from polarons is treated as a resonance problem, using Low's method, but

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Slow electrons in polar crystals

a new method is used to calculate the proper polaron functionals for the initial and final states, however. In order to eliminate the electron coordinates from the polaron energy operator

$$H = -\frac{\hbar^2\nabla^2}{2m} + \sum_k \hbar\omega_k^0 a_k^+ a_k + \sum_k V_k(a_k e^{ikr} + a_k^+ e^{-ikr}), \quad (1.1)$$

the canonical transformation

$$S = \exp\left\{\frac{i}{\hbar}\left(\mathbf{P} - \sum_k \hbar k a_k^+ a_k\right)\mathbf{r}\right\}, \quad (1.5)$$

is used. Then another canonical transformation

$$U = \exp\left\{\sum_k f_k(a_k - a_k^+)\right\}. \quad (1.6)$$

is applied, according to Lee, Low and Pines (Phys. Rev. 90, 297, 1953), so that the energy operator can be given as $H = H_0 + H_I$. In this case the effective Hamiltonian H_0 may be set up as

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$$H_0 = \frac{\mathbf{P}^2}{2m} + 2\sum_k V_k f_k + \sum_k \left(\hbar\omega_k^0 - \frac{\hbar \mathbf{k}\mathbf{P}}{m}\right) f_k^2 + \frac{1}{2m}\left(\sum_k \mathbf{k} f_k^2\right)^2 + \mathcal{H}_0, \tag{1.8}$$

$$\mathcal{H}_0 = \sum_k \hbar\omega_k(\mathbf{P})\, a_k^+ a_k + \frac{1}{2m}\sum_{k,k'} \mathbf{k}\mathbf{k}' f_k f_{k'} (a_k a_{k'} + a_k^+ a_{k'}^+ + a_k^+ a_{k'} + a_{k'}^+ a_k), \tag{1.9}$$

and the operator H_I is given by

$$H_1 = \sum_k (V_k + f_k \cdot \hbar\omega_k(\mathbf{P}))(a_k + a_k^+) + \tag{1.10}$$

$$+ \sum_{k,k'} \frac{\mathbf{k}\mathbf{k}'}{m} f_{k'} (a_k^+ a_k a_{k'} + a_k^+ a_k^+ a_k) + \frac{1}{2m}\sum_{k,k'} \mathbf{k}\mathbf{k}' a_k^+ a_{k'}^+ a_k a_{k'}; \tag{1.11}$$

$$\hbar\omega_k(\mathbf{P}) \equiv \hbar\omega_k^0 - \frac{\hbar \mathbf{k}}{m}\mathbf{P} + \frac{\hbar^2 k^2}{2m} + \frac{\hbar \mathbf{k}}{m}\sum_{k'} \hbar \mathbf{k}' f_{k'}^2.$$

For H_0 the corresponding Heisenberg equations of motion are solved.

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a_k and a_k^+ are the phonon field operators, ω_k^0 is the frequency of longitudinal optical phonons, $\vec{P}$ is the total momentum of the system, f_k a function of k and $\vec{kP}$. Self-energy and effective mass of the polaron are determined: $E = -g^2 - 1.26(g^2/10)^2 - 1.875(g^2/10)^3$, $m^* = 1 + g^2/6 + 2.24(g^2/10)^2$. H_I contributes only in terms of g^6. The strong-coupling approximation, which is considered via the analytical properties of the function

$$D(s) = D(1) + \frac{s-1}{3\pi^3}\int_0^\infty \frac{k^4 f_k^2 \omega_k dk}{(\omega_k^2 - 1)(\omega_k^2 - s)}, \qquad (2.1)$$

with

$$D(1) = 1 + Q \equiv 1 + \frac{1}{3\pi^3}\int_0^\infty \frac{k^4 f_k^2 \omega_k}{\omega_k^2 - 1} dk. \qquad (2.2)$$

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yields $E = -0.105\,\alpha^4$. This is close to previous values (e. g. R. P. Feynman, Phys. Rev. 97, 660, 1955). Polaron scattering is treated as resonance scattering acco ding to Low (Phys. Rev. 97, 1392, 1955) by

$$\langle \mathbf{P}, \mathbf{k} | S - 1 | \mathbf{P}_0, \mathbf{k}_0 \rangle = -2\pi i \delta (E - E_0) R; \tag{3.1}$$

$$R = V_k V_k \int d\upsilon \left((\Psi, e^{-i\mathbf{kr}} (H - E - \omega^0 - i\varepsilon)^{-1} e^{i\mathbf{k}_0 \mathbf{r}} \Psi_0) + (\Psi, e^{i\mathbf{kr}} (H - E + \omega^0 - i\varepsilon)^{-1} e^{-i\mathbf{k}_0 \mathbf{r}} \Psi_0) \right). \tag{3.2}$$

for the sought element of the scattering matrix S. In single-phonon approximation the system

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$$u = 1 - c\sum_k v_k\varphi_{k'} \qquad (3.9a)$$

$$\delta E_k v_k = -u\varphi_k - u\sum_{k'} A_{kk'}\varphi_{k'} - \frac{u}{m}\sum_{k'} kk' f_{k'} A_{kk'} - \\ - \frac{1}{m}\sum_{k'} kk' f_k f_{k'} v_{k'} - \frac{1}{m}\sum_{k'k''} A_{kk'} f_{k'} k'k'' f_{k'} v_{k''}, \qquad (3.9b)$$

$$\delta E_k = (k_0 - k)^2/2m + \mu^{-1}P_0(k_0 - k) - is, \qquad (3.10)$$

$$\varphi_k = -kk_0 f_k/m + V_k + f_k\omega_k = -kk_0 f_k/m + \Phi_k,$$

has the solution

$$cu = \left\{ \frac{k_0^2}{2m} \frac{1 - I - K + 2U}{1 + I + K} - \omega^0 (N + T + 1) \right\}^{-1};$$

$$U = 2L + M + (L + S)(L + M), \qquad (3.11)$$

$$I = \sum_k \frac{(\mathbf{k}\mathbf{k}_0)^2 f_k^2}{m k_0^2 \delta E_k}, \quad K = \sum_k \frac{(\mathbf{k}\mathbf{k}_0)^2 f_k T_k}{m k_0^2 \delta E_k}, \quad L = \sum_k \frac{\mathbf{k}\mathbf{k}_0 f_k \Phi_k}{k_0^2 \delta E_k},$$

$$M = \sum_k \frac{\mathbf{k}\mathbf{k}_0 \Phi_k T_k}{k_0^2 \delta E_k}, \quad S = \sum_k \frac{\mathbf{k}\mathbf{k}_0 k^2 f_k T_k}{m k_0^2 \delta E_k}, \quad T = \frac{1}{\omega^0} \sum_k \frac{k^2 f_k \Phi_k}{m \delta E_k}, \qquad (3.12);$$

$$N = \frac{1}{\omega^0} \sum_k \frac{\Phi_k^2}{\delta E_k}, \quad T_k \equiv \sum_{k'} \frac{(\mathbf{k}\mathbf{k}')^2}{k'^2} Q(k, k').$$

$u = \frac{2m\omega^0}{}$. If $g^2 \approx 1$. g^2_{max} is calculated for several simple cubic lattices, the scattering probability per unit of time,

$$w = \frac{1}{\tau} = \frac{m^* P_0}{8\pi^4} \int |V_{k_0}|^4 |cu(k_0)|^2 e^{-\omega_0/kT} dk_0. \qquad (3.13)$$

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Slow electrons in polar crystals

will assume the well known form(Low, Pines). It was found to be between 7.7 for LiF, 9.7 for RbBr, 8.4 for NaCl, and 8.6 for KCl. The author thanks Academician V. A. Fok, Professor G. Lehmann and Professor W. Zimmermann for interest and advice, Professor G. Höhler for reference to a paper of T. D. Schultz (Phys. Rev. 116, 526, 1959) and Professor L. E. Gurevich and V. I. Perel' for discussions. B. I. Davydov and I. M. Shmushkevich (UFN, 24, 21, 1940) are mentioned. There are 2 figures, 1 table, and 12 references: 4 Soviet and 8 non-Soviet. The four most recent references to English-language publications read as follows: K. Kobayashi, F. C. Brown. Phys. Rev., 113, 507, 1959; D. C. Burnham, F. C. Brown, R. Knox. Phys. Rev., 119, 1560, 1960; T. D. Schultz. Phys. Rev., 116, 526, 1959; H. Osaka. Progr. Theor. Phys., 25, 517, 1961.

ASSOCIATION: Leningradskiy gosudarstvennyy universitet (Leningrad State University)

SUBMITTED: March 23, 1961

Card 8/8

TULUB, A.V.

Correlation energy and collective excitations for interacting Fermi fields. Vest. LGU 17 no.16:20-29 '62. (MIRA 15:9)
(Quantum field theory)

ACCESSION NR: AP4010231 S/0054/63/000/004/0007/0017

AUTHOR: Tulub, A. V.

TITLE: On the problem of collective electron excitation in long conjugated molecules

SOURCE: Leningrad. Universitet. Vestnik. Seriya fiziki i khimii, vyp. 4, 1963, 7-17

TOPIC TAGS: plasmon, collective excitation, conjugated molecule, alternating bond, wave function,

ABSTRACT: The plasma collective excitation energy has been calculated for very long conjugated molecules within π-electron approximation. Two sets of equations are written, one for the case of nonalternating bonds

$$Wc_n+\beta(c_{n-1}+c_{n+1})=0,$$

where β - exchange integral, W = Q-E, Q - coulomb integral, E - energy, and one for alternating bonds

$$\beta_1 X_n+WY_n+\beta_2 X_{n+1}=0,$$
$$\beta_2 Y_n+WX_{n+1}+\beta_1 Y_{n+1}=0,$$

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ACCESSION NR: AP4010231

where

$$X_n \equiv c_{2n-1}; \quad Y_n \equiv c_{2n}.$$

Solutions for the Hamiltonian system are given for boundary conditions corresponding to polyene chains, cyclic compounds, and for odd and even carbon atom numbers N. The collective excitation spectra is represented by the wave function

$$\Psi = A^* \Psi_0,$$

where in the assumed LKAO approximation, the A operator is defined by

$$[H, A^*] = \hbar\Omega A^*, \quad [A, A^*] = 1.$$

The solution shows that the collective excitation spectra are located considerably above the single-particle transition line and that this excitation requires a high energy (of order of 5 ev.)It is found that as N increases, the plasmon frequency tends, as a result of bond alternation, to a finite limit. The existence of bond alternation in itself leads to the energy gap and to the possibility of excitation of Wannier-Mott excitons. "The author is grateful to Professor M. G. Veselov for his help in the work." Orig. art. has: 43 equations.

ASSOCIATION: none

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TULUB, A.V.

Collective excitations of electrons in long molecules with conjugate bonds. Vest. LGU 18 no.22:7-17 '63. (MIRA 17:1)

TULUB, A.V.

Plasma oscillations of π-electrons in molecules. Zhur. eksp. i teor. fiz. 45 no.5:1450-1452 N '63. (MIRA 17:1)

1. Leningradskiy gosudarstvennyy universitet.

NOVOZHILOV, Yuriy Viktorovich, doktor viz.-matem. nauk, prof.;
[illegible], A.V., kand. fiz.-matem. nauk, nauchn. red.

[Quantum field theory and elementary particles] Kvantovaia teoriia polia i elementarnye chastitsy. Leningrad, Ob-vo "Znanie" RSFSR, 1965. 39 p. (MIRA 18:10)

L 11662-66 FBD/EWT(1)/EEC(k)-2/T/EWP(k)/EWA(m)-2/EWA(h) SCTB/IJP(c) WG

ACC NR: AP6003244 SOURCE CODE: UR/0020/65/165/006/1280/1283

AUTHOR: Rozanov, N. N.; Tulub, A. V.

ORG: none

TITLE: On the theory of the Zeeman effect in gas lasers

SOURCE: AN SSSR. Doklady, v. 165, no. 6, 1965, 1280-1283

TOPIC TAGS: gas laser, neon helium laser, nonlinear effect, Zeeman effect, Zeeman effect laser

ABSTRACT: Nonlinear effects in a neon-helium laser were investigated theoretically on the basis of the generalized Lamb's method (W. E. Lamb, Jr., Phys. Rev., 134, no. 6, 1964, A1429). The anomalous coherence region in H observed by W. Culshaw and J. Kannelaud (Phys. Rev., 136, no. 5, 1964, A1209) was explained under the assumption that the generation frequency is, in general, independent of the transition frequency and the natural frequency of the cavity. Thus, although the distance between the Zeeman sublevels increases with H, the increase in the difference of generating frequencies due to the effects of frequency pulling and pushing is not explicit. The formulas derived cannot be properly compared with the experimental data of Culshaw and Kannelaud, who failed to provide sufficient data on their laser and the experimental conditions. Orig. art. has: 7 formulas and 2 figures. [YK]

SUB CODE: 20 / SUBM DATE: 29Apr65/ ORIG REF: 002/ OTH REF: 005/ ATD PRESS: 4175

UDC: 621.378.33:538.615

Card 1/1

L 25632-66 EWT(d)/EWT(l)/T IJP(c)

ACC NR: AP6016071 SOURCE CODE: UR/0054/65/000/003/0007/0020

AUTHOR: Fok, V. A.; Tulub, A. V.

ORG: none

TITLE: Application of Laplace transformation to problems in theory of radiation

SOURCE: Leningrad. Universitet. Vestnik. Seriya fiziki i khimii, no. 3, 1965, 7-20

TOPIC TAGS: Laplace transform, quantum field theory, integral equation, differential equation

ABSTRACT: The system of atomic amplitude equations in the quantum field theory of radiation is transformed into a single integral-differential equation the solution of which may be obtained by using the Laplace transformation. The method developed is applied to the calculation of the natural line width, resonance fluorescence, and external field problems. Orig. art. has: 4 formulas. [Based on authors' Eng. abst.] [JPRS]

SUB CODE: 20, 12 / SUBM DATE: 05Apr65 / ORIG REF: 003 / OTH REF: 005

UDC: 535.14

Card 1/1

FOK, V.A.; TULUB, A.V.

Use of the Laplace transform in solving problems in radiation theory. Vest. LGU 20 no.16:7-20 '65. (MIRA 18:9)

SMELYANETS, S.G., inzh.; KAPLAN, I.A., inzh.; FAYNBERG, G.S., inzh.; TULUB, P.I., inzh.

Industrial testing of the ONK-10 equipment. Shakht. stroi. 9 no.7:27-28 Jl '65. (MIRA 18:10)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut organizatsii i mekhanizatsii shakhtnogo stroitel'stva.

Concerning the possible interpretation of the vibrational spectra of simple silicate glasses. V. A. Bobrovich, O. P. Girin, and T. P. Tolub. *Doklady Akad. Nauk S.S.S.R.* 105, 61-4(1955).—An attempt was made to deduce the [illegible] simple silicate glasses on the basis of their vibrational [illegible] have been incorrectly interpreted pre[illegible] 2-component silicate glasses [illegible] were measured by using [illegible] Particular attention was [illegible] natural [illegible] polarized light [illegible] although all the glasses manifested [illegible] polarized [illegible] 525, [illegible] [illegible] common to fused quartz [illegible] glass structure consists of infinite metasilicate chains $(SiO_3)_\infty$ with quartzlike islands interspersed. The relative amts. of each depend on the particular glass. Matossi's expression was adapted for linear chain mols. to calc. the force consts. and frequencies for the vibrations in each symmetry class. The [illegible] and exptl. frequencies closely coincide.

Robert D. Kross

BOBOVICH, Ya.S.; TULUB, T.P.

Some new data on the Raman spectra of two-component glasses. Zhur.fiz.khim. 30 no.7:1679-1680 Jl '56. (MLRA 9:11)
(Glass manufacture--Chemistry)

BOBOVICH, Ya.S.; TULUB, T.P.

Temperature dependence of the intensity of Raman scattering bands in crystalline and vitreous bodies. Part 1: Experimental study in the Stokes region of the spectrum. Opt. i spektr. 9 no. 6:747-753 D '60. (MIRA 14:1)
(Raman effect)

Tulub, T.P.

B-4

USSR/Physical Chemistry - Molecule, Chemical Bond.

Abs Jour: Referat. Zhurnal Khimiya, No 2, 1958, 3572.

Author : Ya. S. Bobovich, T.P. Tulub.
Inst :
Title : Raman Effect of Two-Component Silicate Glasses and Their Structure.

Orig Pub: Optika i spektroskopiya, 1957, 2, No 2, 174-185.

Abstract: Frequencies, intensities and depolarization were studied in Raman spectra (excited by a powerful spiral mercury low pressure tube and recorded by the photoelectric method) of two-component sodium and potassium silicate glasses, lead metasilicate and fused quartz. A continuous Raman effect close to the exciting line was observed in spectra of specimens poor in alkalis. The curves of the frequency dependence on the percentual SiO content and the intensity dependence of some lines on the composition are given for sodium silicate glasses. Po-

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Abs Jour: Referat. Zhurnal Khimiya, No 2, 1958, 3572.

larization spectra of fused quartz, some sodium silicate glasses and sodium metasilicate were produced, at which occasion great distinctions indicating a sharp difference in the structures of glasses and quartz were observed. An assumption confirmed with computation was made that two-component silicate glasses were quartz-like islets interchanging with chain formations of SiO tetrahedrons. Secular equations of the vibration frequencies of an endless chain were derived. The force constants of Si-O (free) and Si-O (bound) links equal to 7.33 and 3.79 . 10^5 dynes per cm were determined by the frequencies of 1170 (A_1) and 696 (A_2). The frequencies A_1 and B_2 computed from these constants agree well with the observed frequencies (1170, 1090, 525 - A_1, 945 - B_2). The three first frequencies are polarized. The frequencies B were not determined. A bibliographical review is given. Bibliography with 32 titles.

BOBOVICH, Ya.S.; TULUB, T.P.

Raman spectra investigation of the influence of chemical elements on the structure of silicate glasses. Opt. i spektr. 5 no.6:663-670 D '58. (MIRA 12:1)

(Glass--Spectra) (Raman effect)

BOBOVICH, Ya.S.; TULUB, T.P.

Raman spectra and structure of some inorganic glasses. Usp. fiz. nauk 66 no.1:3-41 S '58. (MIRA 11:12)
(Glass) (Raman effect)

SOV/51-5-2-21/26

AUTHORS: Bobovich, Ya.S. and Tulub, T.P.

TITLE: The Raman Spectra of Certain Germanium Glasses (Spektry kombinatsionnogo rasseyaniya nekotorykh germaniyevykh stekol)

PERIODICAL: Optika i Spektroskopiya, 1958, Vol 5, Nr 2, pp 210-213 (USSR)

ABSTRACT: The Raman spectra of glassy GeO_2, sodium bigermanate ($Na_2O.2GeO_2$) and a mixed orthosilicate of the composition $2Na_2O.GeO_2.2SiO_2$ were obtained by photoelectric recording in natural and polarized light. Fig 1 gives the general nature of the Raman spectrum of glassy GeO_2 and the state of polarization of this spectrum. Fig 2 compares the spectra of SiO_2 (curve a) and GeO_2 (curve b) which confirm the structural similarity of these two substances. The spectra of $Na_2O.2SiO_2$ (curve a) and $Na_2O.2GeO_2$ (curve b) are compared in Fig 3. The identity of structures of germanium and silicate glasses, shown by Figs 2 and 3, is confirmed by direct calculation. Fig 4 compares the spectrum of $2Na_2O.GeO_2.2SiO_2$ (curve a) with that of the two-component silicate glass Na-40 (curve b).

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The Raman Spectra of Certain Germanium Glasses

This figure shows that Na_2O, in accordance with Dietzel's suggestion (Refs 6, 7), is distributed uniformly between SiO_2 and GeO_2. There are 4 figures and 8 references, 4 of which are Soviet, 2 German, 1 French and 1 American.

ASSOCIATION: Gosudarstvennyy opticheskiy institut im. S.I. Vavilova (State Optical Institute imeni S.I. Vavilov)

SUBMITTED: March 5, 1958

Card 2/2 1. Germanium alloys--Spectrographic analysis 2. Raman spectroscopy --Applications 3. Mathematics--Applications

BOBOVICH, Ya.S.; TULUB, T.P.

Effect of temperature on the intensity of the Stokes lines of the Raman spectra of some solids. Opt. i spektr 6 no.4:566-569 Ap '59. (MIRA 12:5)

(Raman effect) (Quartz crystals--Spectra)

TULUB, T.P.; BOBOVICH, Ya.S.

On the effect of the refractive index on the temperature dependence of Raman scattering band intensities. Opt. i spektr. 9 no.5:669-670 N '60. (MIRA 13:11)
(Raman effect) (Refractive index)

S/051/60/009/006/007/018
E201/E191

AUTHORS: Bobovich, Ya.S., and Tulub, T.P.

TITLE: The Temperature Dependence of the Raman Band Intensities in Crystalline and Vitreous Solids. I. An Experimental Study in the Stokes Region of the Spectrum

PERIODICAL: Optika i spektroskopiya, 1960, Vol.9, No.6, pp 747-753

TEXT: The temperature dependence of the Raman band intensities in the Stokes region was obtained for crystalline quartz, Iceland spar, fluorite, corundum, barytes, fused quartz, alkali glass, polymethylmethacrylate and polystyrene. Details of the experimental technique are given in an earlier paper (Ref.11). The main results are listed in Tables 1-2 and shown in Figs 1-3. Tables 1 and 2 give the Raman intensities at two temperatures for barytes (Table 1) and polymethylmethacrylate (Table 2). The Iceland spar spectra at room temperature (curve a) and at 540 °K (curve б) are given in Fig.1. The temperature dependences of the intensities of the 330 cm⁻¹ Raman band of fluorite and of the 400 cm⁻¹ Raman band of fused quartz are shown in Figs 2 and 3 respectively; curves denoted by 1 in Figs 2

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S/051/60/009/006/007/018
E201/E191

The Temperature Dependence of the Raman Band Intensities in Crystalline and Vitreous Solids. I. An Experimental Study in the Stokes Region of the Spectrum

and 3 are experimental, curves denoted by 2 are theoretical. Except for Iceland spar and polymethylmethacrylate, the temperature dependence of the Stokes bands agreed qualitatively with theory, i.e. the band intensity rose with temperature. The results were explained in terms of internal fields, using the refractive index and permittivity of a given solid.
Acknowledgement is made to N.G. Bakhshiyev for his advice.
There are 3 figures, 2 tables and 22 references: 15 Soviet, 2 English, 3 German, 1 Dutch and 1 Indian.

SUBMITTED: March 8, 1960

Card 2/2

Tulov, T. R.

AUTHOR: Syritskaya, Z. M.

S/072/60/000/03/021/023
B003/B003

TITLE: 3rd All-Union Conference on the Vitreous State

PERIODICAL: Steklo i keramika, 1960, Nr 3, pp 43-46 (USSR)

ABSTRACT: The 3rd All-Union Conference on the Vitreous State was held in Leningrad at the end of 1959. It was organized by the Institut khimii silikatov AN SSSR (Institute of the Chemistry of Silicates AS USSR), Vsesoyuznoye khimicheskoye obshchestvo imeni D. I. Mendeleyeva (All-Union Chemical Society imeni D. I. Mendeleyev) and Gosudarstvennyy opticheskiy institut imeni S. I. Vavilova (State Optical Institute imeni S. I. Vavilov). More than 100 reports on the structure of glass, investigation methods of the vitreous state, the mechanism of vitrification and physicochemical and technical properties of glasses were delivered. The Conference was opened by Academician A. A. Lebedev. Fundamental investigation methods and results concerning the glass structure were discussed at the 1st meeting. Academician A. A. Lebedev reported on possibilities and results of optical methods, Ye. A. Poray-Koshits on the diffraction method, K. S. Yevstrop'yev on general problems concerning structure and properties of glasses. The 2nd meeting produced 5 reports on the problem of the vitreous state: R. L. [illegible], "Chemical Peculiarities of Polymeric Vitreous Materials and the

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Nature of Vitrification"; N. A. [illegible] and B. T. [illegible], "On the Problems of Conformities of the Vitrification"; V. V. Tarasov, "Glass as a Polymer"; A. F. Deuval'ter, "Theory of Glass Structure"; A. G. Vlasov, "Natural Oscillations of the Glass Lattice". The 3rd meeting produced 9 reports on investigation results of silicate melts and on problems of the mechanism of vitrification: A. I. Avgustinik, "On the Problem of the Formation of the Crystalline Phase From the Silicate Melt"; O. K. Botvinkin, "Process of Vitrification and the Structure of Glass"; D. N. Leninskikh, O. A. Yesin and V. I. Musikhin, "On the Structure of Melts"; I. T. Kryvalkin and O. A. Yesin, "Thermodynamic Properties of the Silicate Systems $FeO - CaO - SiO_2$ and $CaO - Al_2O_3 - SiO_2$"; G. M. Bartenev, "Mechanical and Structural Vitrification"; M. V. Vol'kenshteyn, "Mechanism of Vitrification". At the 4th meeting, 13 reports dealt with problems of the glass structure and optical investigation methods: V. A. Florinskaya, "Infrared Reflection Spectra of Sodium Silicate Glasses and Their Relations to the Structure"; Ya. S. [illegible] and [illegible], "Smekal-Raman Dispersion of Light and the Structure of Some Silicate Glasses"; V. A. Kolesova, "Investigation of the Vibrational Spectra of Aluminosilicate Glasses"; N. N. Sobolev reported on the work of the Fizicheskiy Institut AN SSSR (Institute of Physics AS USSR) with

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glasses from one component, with the help of infrared spectrophotometry and the Smekal-Raman dispersion; T. A. Sidorov reported on the molecular structure and the properties of the crystalline quartz; S. M. Brekhovskikh and V. P. Cheremisinov reported on structural investigations of lead- and bismuthborate glasses with the aid of infrared spectroscopy; A. G. Vlasov, "The Quantitative Relation of the Orderly and Irregular Phase in Glass"; G. O. Bagdyk'yants and A. G. Alekseyev, "Electronographic Investigation of the Structure of Glasses"; N. A. Voyshvillo, "On the Structure of a Sodium-boron-silicate Glass Submitted to Enduring Thermal Treatment"; N. S. Andreyev, V. I. Aver'yanov, N. A. Voyshvillo, "Structural Interpretation of the Anomal Dispersion of the Visible Light in Sodium-boron-silicate Glasses". At the 5th meeting, 9 reports dealt with the investigation results of sodium-boron-silicate glasses. A. A. Appen and Can' Fu-Si, "Boron and Alumoboron Anomaly of the Properties of Silicate Glasses"; Ye. I. Galant, "On the Coordination Numbers of Aluminum and Boron in Some Glasses"; S. P. Zhdanov reported on structural changes in boron-silicate glasses; Ye. A. Poray-Koshits and S. P. Zhdanov reported on some controversial problems concerning the structure of boron-silicate glasses and their porous products; Ye. A. Poray-Koshits and N. S. Andreyev, "Submicroscopic Inhomogeneities in the Structure of Complex Glasses". The 15 reports at

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BOBOVICH, Ya.S. ; TULUB, T.P.

Raman spectrum study of the effect of various elements on the structure of silicate glass. Izv. AN SSSR. Ser. fiz. 22 no.9: 1086-1088 S '58. (MIRA 11:10)
(Glass--Spectra)

SOV/51-6-4-28/29

24(7), 24(6)

AUTHORS: Bobovich, Ya.S. and Tulub, T.P.

TITLE: Temperature Dependence of Intensities of Stokes' Bands in the Raman Spectra of Certain Solids (Temperaturnaya zavisimost' intensivnosti stoksovykh polos kombinatsionnogo rasseyaniya v spektrakh nekotorykh tverdykh tel)

PERIODICAL: Optika i Spektroskopiya, 1959, Vol 6, Nr 4, pp 566-567 (USSR)

ABSTRACT: Due to inherent experimental difficulties, studies of the temperature dependence of the Raman band intensities in solids reported so far (Refs 3, 5, 6, 8, 15) were inconclusive. The authors used the latest experimental techniques to study this dependence at 300-500°K in crystalline and fused quartz, Iceland spar and two glasses (silicate glass with 24 mol.% Na_2O and 76 mol.% of SiO_2 and borate glass with 20 mol.% of BaO and 80 mol.% B_2O_3. Nichrome wire was wound on to samples and was used to heat them. Temperatures of the samples were deduced from the current in the heater circuit, to within 5-8°C. The Raman spectra were excited by means of a low-pressure mercury lamp and were recorded using an instrument DFS-12 constructed on the basis of the Kiselev double monochromator (Ref 17). To obtain reliable integral intensities, the areas under the recorded bands were measured by means of a planimeter. Complex bands were split into separated lines. The

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Temperature Dependence of Intensities of Stokes' Bands in the Raman Spectra of Certain Solids

Raman band intensities in the spectra of crystalline (Figs 1, 2) and fused (Figs 3, 4) quartz and the two glasses were found to rise with temperature in agreement with theory. In some cases the rise could not be observed because it was of the same order as the experimental error. Iceland spar was the only substance which exhibited anomalous temperature dependence of the Raman band intensity. The anomaly consisted of a 30% fall in the intensity of a 1085 cm^{-1} band on increase of temperature from room to 500°K. There are 4 figures and 18 references, 9 of which are Soviet, 2 English, 4 German, 1 Dutch and 2 Indian.

SUBMITTED: October 18, 1958

TULUB, T. P.

PRIKHOT'KO, A.F.

24(7) p.3 PHASE I BOOK EXPLOITATION SOV/1365

L'vov. Universytet

Materialy X Vsesoyuznogo soveshchaniya po spektroskopii. t. 1: Molekulyarnaya spektroskopiya (Papers of the 10th All-Union Conference on Spectroscopy. Vol. 1: Molecular Spectroscopy) [L'vov] Izd-vo L'vovskogo univ-ta, 1957. 499 p. 4,000 copies printed. (Series: Its: Fizychnyy zbirnyk, vyp. 3/8/)

Additional Sponsoring Agency: Akademiya nauk SSSR. Komissiya po spektroskopii. Ed.: Gazer, S.L.; Tech. Ed.: Saranyuk, T.V.; Editorial Board: Lavisberg, G.S., Academician (Resp. Ed., Deceased), Neporent, B.S., Doctor of Physical and Mathematical Sciences, Fabelinskiy, I.L., Doctor of Physical and Mathematical Sciences, Fabrikant, V.A., Doctor of Physical and Mathematical Sciences, Kornitskiy, V.G., Candidate of Technical Sciences, Rayskiy, S.M., Candidate of Physical and Mathematical Sciences, Klimovskiy, L.K., Candidate of Physical and Mathematical Sciences, Milyanchuk, V.S., Candidate of Physical and Mathematical Sciences, and Glauberman, A. Ye., Candidate of Physical and Mathematical Sciences.

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BOBOVICH, Ya.S.; TULUB, T.P.

Raman spectra of various germanium glasses. Opt. i spektr. 5 no. 2:210-213 Ag '58. (MIRA 11:10)

1. Gosudarstvennyy opticheskiy institut imeni S.I.Vavilova.
(Glass--Spectra)

SOV/51-5-6-5/19

AUTHORS: Bobovich, Ya.S. and Tulub, T.P.

TITLE: Investigation of the Effect of Chemical Elements on the Structure of Silicate Glasses by the Study of Raman Scattering of Light (Issledovaniye vliyaniya khimicheskikh elementov na stroyeniye silikatnykh stekol metodom kombinatsionnogo rasseyaniya sveta)

PERIODICAL: Optika i Spektroskopiya, 1958, Vol 5, Nr 6, pp 663-670 (USSR)

ABSTRACT: The authors studied mixed metasilicates of the $Na_2O.MeO.2SiO_2$ and orthosilicates of the $Na_2O.Me_2O_3.2SiO_2$ and $2Na_2O.MeO_2.2SiO_2$ types, where Me is a trivalent or quadrivalent element respectively. The effects of the following elements were studied: Be, Mg, Ca, Sr, Ba, Zn, Cd, Pb, Al, Bi, B, Ti, Ge, Zr. Table 2 gives the values of Raman frequencies of all the glasses studied. These glasses can be divided into three groups. The Raman spectra of certain of the glasses of the first group are given in Fig 1. The polarized spectrum of the $Na_2O.PbO.2SiO_2$ glass is given in Fig 2. The spectra of the glasses belonging to the first group show an intense continuous polarized band, with a small peak (625 cm^{-1}) near the band edge and high-frequency bands with maxima near 1000 cm^{-1}. The band widths and the presence

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of continuous spectra indicate partial space linking of the majority of SiO_4 tetrahedra via Me atoms. The 625 cm^{-1} band indicates that only a small number of Na_2O and SiO_2 molecules forms structures similar to metasilicate chains. Comparison of the Raman spectra of glasses containing Pb, Mg and B (all of which belong to the first group and are shown in Fig 3) suggests that the B--O bond has the weakest covalence. The second group of glasses includes glasses with CaO, BaO and SrO. Their spectra are given in Fig 4. These spectra have somewhat narrower bands and there are two weak depolarized maxima at 320 and 470 cm^{-1} instead of the continuous spectrum exhibited by the glasses of the first group. The spectra of the glasses of the second group are similar, with the exception of the 320 and 470 cm^{-1} bands, to the spectra of sodium-silicate glasses of the metasilicate type. This similarity is particularly noticeable for the $Na_2O.SrO.2SiO_2$ glass whose spectrum is given together with that of $Na_2O.SiO_2$ in Fig 5. It is concluded that in the glasses of the second group the third element, like sodium, is present as a cation and, therefore, their spectra show vibrations of metasilicate silicon--oxygen chains. The third group contains only one glass: $2Na_2O.TiO_2.2SiO_2$. Its spectrum is shown

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in Figs 6 (in unpolarized light) and 7 (in polarized light). An intense polarized band is observed at 875 cm^{-1} (Fig 7). A continuous polarized spectrum is also observed and its edge is displaced to 750-800 cm^{-1}. Two wide bands: one depolarized at 345 cm^{-1} and the other polarized at 710 cm^{-1} are observed against the continuous background. There is also a weak depolarized satellite (at 1015 cm^{-1}) of the 875 cm^{-1} band. This spectrum indicates that there are vibrations of free SiO_4 tetrahedra and of a complex space network of $SiO_2.TiO_2$. The edge of the continuous spectrum is displaced towards higher frequencies because of the high strength of the Ti-O bond. Conclusions about the structure of glasses obtained using the Raman spectra were found to agree with the results of other indirect methods. There are 7 figures, 2 tables and 25 references, 11 of which are Soviet, 4 American, 4 English, 3 German, 2 translations and 1 French.

SUBMITTED: January 30, 1958

Card 3/3

AUTHORS: Bobovich, Ya. S., Tulub, T. P. SOV/48-22-9-19/40

TITLE: Investigation of the Influence of Various Elements Upon the Structure of Silicate Glasses by the Method of Combination Light Dispersion (Issledovaniye vliyaniya razlichnykh elementov na stroyeniye silikatnykh stekol metodom kombinatsionnogo rasseyaniya sveta)

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1958, Vol 22, Nr 9, pp 1086 - 1088 (USSR)

ABSTRACT: The determination of the influence of chemical elements upon the structure of this glass is an important problem both from a theoretical and a practical point of view. Mixed metasilicates of the type $Na_2O.MeO.SiO_2$ and orthosilicates of the type $Na_2O.Me_2O_3.2SiO_2$ and $2Na_2O.MeO_2.2SiO_2$ corresponding to bi-, tri-, and quadrivalent Me served as specimens. This choice was not made at random. It can easily be shown that by this choice it is possible to combine certain spectral features with an arbitrary glass structure. The authors investigated

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Investigation of the Influence of Various Elements Upon the Structure of Silicate Glasses by the Method of Combination Light Dispersion SOV/48-22-9-13/40

the influence of all important and practically accessible elements (Be,Mg,Ca,Sr,Ba,Zn,Cd,Pb,Al,Bi,B,Ti,and Zr). The majority of specimens were notable for their defects and thus were unsuited for studies by conventional experimental methods. The experience gained permits to state that these elements can be categorized into three groups according to their influence upon the general nature of the spectra. Spectra of the first and most numerous group are shown in figure 1. This group is characterized by a more or less continuous polarized dispersion. A small maximum is found near the edge, approximately keeping its position in all glass types ($\sim$625 cm^{-1}). An extremely wide band maximum is found at a high frequency ($\sim$980 cm^{-1}). The second group includes three glasses containing the oxides CaO, BaO, and SrO (Fig 2). The third group includes glass of the type $2Na_2O.TiO_2.2SiO_2$ (Fig 3). There are 3 figures and 7 references, 7 of which are Soviet.

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TULUB, T.P.

PHASE I BOOK EXPLOITATION SOV/5035

Vsesoyuznoye soveshchaniye po stekloobraznomu sostoyaniyu. 3d, Leningrad, 1959.

Stekloobraznoye sostoyaniye; trudy Tret'yego vsesoyuznogo soveshchaniya Leningrad, 16-20 noyabrya 1959 (Vitreous State; Transactions of the Third All-Union Conference on the Vitreous State, Held in Leningrad on November 16-20, 1959) Moscow, Izd-vo AN SSSR, 1960. 534 p. Errata slip inserted. 3,200 copies printed. (Series: Its: Trudy)

Sponsoring Agencies: Institut khimii silikatov Akademii nauk SSSR. Vsesoyuznoye khimicheskoye obshchestvo imeni D.I. Mendeleyeva and Gosudarstvennyy ordena Lenina opticheskiy institut imeni S.I. Vavilova.

Editorial Board: A.I. Avgustinik, V.P. Barzakovskiy, M.A. Bezborodov, O.K. Botvinkin, V.V.Vargin, A.G. Vlasov, K.S. Yevstrop'yev, A.A. Lebedev, M.A. Matveyev, V.S. Molchanov, R.L. Myuller, Ye.A. Poray-Koshits, Chairman, N.A. Toropov, V.A. Florinskaya, A.K. Yakhkind; Ed. of Publishing House: I.V. Suvorov; Tech. Ed.: V.T. Bochever.

PURPOSE: This book is intended for researchers in the science and technology of glasses.

COVERAGE: The book contains the reports and discussions of the Third All-Union Conference on the Vitreous State, held in Leningrad on November 16-19, 1959. They deal with the methods and results of studying the structure of glasses, the relation between the structure and properties of glasses, the nature of the chemical bond and glass structure, and the crystallochemistry of glass. Fused silica, mechanism of vitrification, optical properties and glass structure, and the electrical properties of glasses are also discussed. A number of the reports deal with the dependence of glass properties on composition, the tinting of glasses and radiation effects, and mechanical, technical, and chemical properties of glasses. Other papers treat glass semiconductors and soda borosilicate glasses. The Conference was attended by more than 500 delegates from Soviet and East German scientific organizations. Among the participants in the discussions were N.V. Solomin, Ye. V. Kuvshinskiy, Yu.A. Gastev, V.P. Pryanishnikov, Yu. Ya. Gotlib, O.P. Mchedlov-Petrosyan, G.P. Mikhaylov, S.N. Petrov, A.N. Lazarev, D.I. Levin, A.V. Shatilov, N.T. Ploshchinskiy, A.Ya. Kuznetsov, E.V. Degtyareva, G.V. Byurganovskaya, A.A. Kalenov, M.M. Skornyakov, P.Ya. Bokin, E.K. Keller, Ya.A. Kuznetsov, V.P. Pozdnev, R.S. Shevelevich, Z.G. Pinsker, and O.S. Molchanova. The final session of the Conference was addressed by Professor I.I. Kitaygorodskiy, Honored Scientist and Engineer, Doctor of Technical Sciences. The following institutes were cited for their contribution to the development of glass science and technology: Gosudarstvennyy opticheskiy institut (State Optical Institute), Institut khimii silikatov AN SSSR (Institute of Silicate Chemistry, AS USSR), Fizicheskiy institut AN SSSR (Physics Institute AS USSR), Fiziko-tekhnicheskiy institut AN SSSR (Physicotechnical Institute AS USSR), Institut fiziki AN BSSR, Minsk (Institute of Physics, Academy of Sciences, Belorusskaya SSR, Minsk), Laboratory of Physical Chemistry of Silicates of the Institut obshchey i neorganicheskoy khimii AN BSSR, Minsk (Institute of General and Inorganic Chemistry, Academy of Sciences, Belorusskaya SSR, Minsk), Institut vysokomolekulyarnykh soyedineniy AN SSSR (Institute of High Molecular Compounds, AS USSR), Gosudarstvennyy institut stekla (State Institute for Glass), Gosudarstvennyy institut steklovolokna (State Institute for Glass Fibers), Gosudarstvennyy institut elektrotekhnicheskogo stekla (State Institute for Electrical Glass), Sibirskiy fiziko-technicheskiy institut, Tomsk (Siberian Physicotechnical Institute, Tomsk), Leningradskiy gosudarstvennyy universitet (Leningrad State University), Moskovskiy khimiko-tekhnologicheskiy institut (Moscow Institute of Chemical Technology), Leningradskiy tekhnologicheskiy institut im. Lensoveta (Leningrad Technological Institut imeni Lensovet), Belorusskiy politekhnicheskiy institut Minsk (Belorussian Polytechnic Institute, Minsk), Novocherkasskiy politekhnicheskiy institut (Novocherkassk Polytechnic Institute), and Sverdlovskiy politekhnicheskiy institut (Sverdlovsk Polytechnic Institute). The Conference was sponsored by the Institute of Silicate Chemistry AS USSR (Acting Director - A.S. Gotlib), the Vsesoyuznoye khimicheskoye obshchestvo im. D.I. Mendeleyeva (All-Union Chemical Society imeni D.I. Mendeleyev), and the Gosudarstvennyy ordena Lenina opticheskiy institut imeni S.I. Vavilova (State "Order of Lenin" Optical Institute imeni S.I. Vavilov). The 15 resolutions of the Conference include recommendations to organize a Center for the purpose of coordinating the research on glass, to publish a new periodical under the title "Fizika i khimiya stekla" (Physics and Chemistry of Glass), and to join the International Committee on Glass. The Conference thanks A.A. Lebedev, Academician, Professor, and Chairman of the Organization of Committee; Ye.A. Poray-Koshits, Doctor of Physics and Mathematics, Member of the Organizational Committee; and R.L. Myuller, Doctor of Chemical Sciences, Member of the Organizational Committee. The editorial board thanks G.M. Bartenev, M.V. Vol'kenshteyn, L.I. Denkina, D.P. Dobychin, S.K. Dubrovo, V.A. Ioffe, and B.T. Kolomiyets. References accompany individual reports.

Vitreous State (Cont.) SOV/5035

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Vitreous State (Cont.) SOV/5035

Vitreous State (Cont.) SOV/5035

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BOBOVICH, Ya.S.; TULUB, T.P.

Raman spectra of alkali-germanium glasses. Opt. i spektr. 7 no.4:489-492 Ap '62. (MIRA 15:5)
(Glass) (Raman effect)

SOV/53-66-1-1/11

AUTHORS: Bobovich, Ya. S., Tulub, T. P.

TITLE: The Spectra of Combination Scattering and the Structure of Some Sorts of Inorganic Glass (Spektry kombinatsionnogo rasseyaniya i stroyeniye nekotorykh neorganicheskikh stekol)

PERIODICAL: Uspekhi fizicheskikh nauk, 1958, Vol. 66, Nr 1, pp. 3 - 41 (USSR)

ABSTRACT: The aim of the present paper was to give, to the reader a survey as complete as possible on publications dealing with combination scattering in silicate glass. As an introduction the author discusses the problem itself, the investigation of the amorphous substances, the classical theory (Tamman), the physical bases (P.P.Kobeko), the mathematical (M.V. Vol'kenshteyn, O.B.Ptitsyn) and a number of experimental investigations (Refs 1 - 16). Subsequently the method of the combination scattering of light in its application to the investigation of glass is discussed (Refs 17 - 27) and finally the results of the experimental investigation are discussed. The chapters: The general character of the scattering (Refs 28 - 43); the sorts of two-component silicate glass (M.F.Vuks,

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The Spectra of Combination Scattering and the Structure of Some Sorts of Inorganic Glass SOV/53-66-1-1/11

V.A.Ioffe - sodium and lead silicate glass, Gross, Kolesova (Refs 46, 47) - connections between the frequency of the band spectra and the composition of the glass, photoelectric investigations of spectra); investigation of the influence of various chemical elements on the structure of silicate glass (Refs 26,27, Bobovich, Tulub, et al. frequencies and polarisation of the bands in the spectra of mixed ortho- and para-silicate glass, photoelectric investigations of spectra and of polarisation, schematic representation of various multi-component alkali, lead, and titanium silicate sorts); the spectra of liquid silicates - esters of the ortho-silicic acid, investigated in analogous way as silicate glass; (numerous results on frequencies, intensities, and states of polarisation of compounds of the general formula $Si(OC_mH_n)_4$ after Lazarev, Tulub, Bobovich). The last section deals with the theoretical interpretation of the spectra of scattering of some crystals compared with the experimental data obtained for some sorts of silicate and germanium glass. There are 25 figures, 5 tables, and 83 references, 40 of which are Soviet.

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The Spectra of Combination Scattering and the Structure of Some Sorts of Inorganic Glass SOV/53-66-1-1/11

1. Glass--Properties 2. Glass--Spectra 3. Light-Scattering

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